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INFECTIOUS DISEASE RISKS IN THE TRANSMIGRATION AREA, WAY ABUNG III, LAMPUNG PROVINCE. *

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ABSTRACT

Telah dilakukan pemeriksaan secara laboratoris terhadap kesehatan transmigran yang berasal dari Jawa sebelum (1976) dan kurang lebih 2 tahun (1978) sesudah mereka menempati daerah transmigrasi Way Abung III, Lampung. Tujuan pemeriksaan ini adalah untuk mengetahui penyakit-penyakit yang mengancam mereka di daerah barunya. Pemeriksaan telah dilakukan terhadap sediaan darah yaitu untuk mengetahui adanya parasit malaria dan mikrofilaria, sedangkan pemeriksaan serologis untuk mengetahui adanya infeksi arbovirus, scrub dan murine typhus. Pemeriksaan tinja dilakukan hanya pada tahun 1976 untuk mengetahui adanya parasit usus.

Dari hasil pemeriksaan tadi ditemukan bahwa prevalensi malaria meningkat dari 0,2% (1976) menjadi 10% (1978), sedangkan mikrofilaria rate sebelum dan sesudah pemindahan tetap 0.
Hasil pemeriksaan tinja terhadap transmigran sebelum tiba di Lampung menunjukkan prevalensi Ascaris lumbricoides, Trichuris trichiura dan cacing tambang berturut-turut sebesar 46%, 28% dan 80%.

Serologis hemagglutination inhibition (HI) antibody positive terhadap Japanese encephalitis (JE) virus naik dari 43,3% menjadi 74,2%, sedangkan prevalensi HI antibody positive terhadap chikungunya (CHIK) virus tetap sama yaitu 3,5% sebelum dan 2,9% sesudah pemindahan. Prevalensi positif fluorescent antibody test (FAT) terhadap scrub dan murine typhus juga tidak ada perubahan yaitu 4,0% sebelum dan 3,4% sesudah pemindahan untuk scrub typhus dan 13,7% sebelum dan 13,8% sesudah pemindahan untuk murine typhus. Dari hewan-hewan yang terdapat di Way Abung III, serologis positif HI antibody kambing mempunyai prevalensi tertinggi (3%) terhadap arbovirus Group A (alpha virus) dan sapi tertinggi (35%) terhadap arbovirus Group B (flavivirus). Vektor-vektor potensial malaria, filariasis, scrub dan murine typhus, dan arbovirus infeksi dapat dijumpai di daerah transmigrasi Way Abung III, Lampung.

Kecuali malaria ditarik kesimpulan bahwa diperlukan paired data untuk prevalensi cacing-cacing dan prevalensi serologis positif antibody terhadap arbovirus untuk memastikan apakah Way Abung lebih berbahaya daripada daerah asal transmigran.

INTRODUCTION

In the framework of the resettlement programme for the people of over crowded Java and Bali, series of morbidity surveys were carried out between the years 1975 through 1978.

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The objective was to study the risk to settlers of contracting infectious diseases in their new environments, which were often characterized by remoteness, poor communication, and inadequate health services. The study consisted of three phases. In Phase 1 a comprehensive biomedical survey was carried out in 1975 to determine the morbidity rates of parasitic diseases and seropositivity of arboviral and rickettsial antibodies in the human population of the resettlement area, Way Abung III, in Lampung Province, and results of this survey were published by Gandahusada et al. (1981). Phase 2 of the survey was done in 1976. The transmigrants en route to their various new settlement in Sumatra were examined for parasitic infections and for antibodies to various arboviral and rickettsial antigens. In 1978, a follow-up survey (Phase 3) was undertaken of these transmigrants two years after their arrival in Way Abung III, Lampung Province, Sumatra.

We report herein the results of Phase 2 and Phase 3 surveys.

MATERIALS AND METHODS

In Phase 2 from June – September 1976 (designated as pre-stage), three groups of transmigrants consisting of 767 people from East Java were examined in Jakarta on their way to transmigration areas in Sumatra. The name, age and sex of these people were registered. Blood specimens from finger tips and by vena puncture were collected between 20.00 to 24.00 hours. Stool samples were also collected.

For the Phase 3, in June 1978 (post-stage) transmigrants in Papanrejo, Unit C of Way Abung III, were examined. Blood specimens were taken from these people between 20.00 – 24.00 hours. No fecal samples were taken. During this phase, blood samples were taken from domestic animals, such as cattle, goats, dogs, chicken, and ducks. Wild avian and bats species were caught by mist nets. Rats were trapped from 17.00 – 06.00 hours in houses, gardens, fields, scrubs and nearby forest. All these wild animals were killed, identified, and examined for ecto- and endoparasites. Blood samples were also taken. Serological tests were undertaken to identify antibodies of arboviral and rickettsial antigens in man, domestic animals and wild animals, and the procedures followed that described by Gandahusada et al. (1981). Hemagglutination-inhibition (HI) titers of 1 : 10 or greater were considered positive evidence of prior infection with Chikungunya (CHIK) and Japanese B encephalitis (JE) viruses, and a fluorescent antibody titer (FAT) of 1 : 40 or greater was considered as positive evidence of prior rickettsial infection.

A survey of the mosquito fauna in the area was also made. Mosquitoes were caught by light trap and attraction to human baits. Mosquitoes were killed with chloroform and identified to species.

RESULTS

The age composition of the 767 people in the three groups of transmigrants examined in the Phase 2 survey is presented (Table 1). Of the 214 fecal samples examined, 11 species of intestinal parasites were identified. The prevalence rates for each of the parasite species was very variable from one district of origin to another. Parasites found in highest prevalence were *Ascaris lumbricoides*, *Trichuris trichiura*

Table 1. Age composition of the transmigrants en-route to their new residence in Sumatra (June – September 1976).

Age group in years	Number of transmigrants			
	Group I	Group II	Group III	Total (%)
< 1	6	0	3	9 (1.2)
1 – 9	64	43	112	219 (28.6)
10 – 19	30	79	59	168 (21.9)
20 – 29	37	34	51	122 (15.9)
30 – 39	44	26	65	135 (17.6)
40 – 49	20	37	19	76 (9.9)
50 – 59	0	29	2	31 (4.0)
⩾ 60	2	4	1	7 (0.90)
Total	203	252	312	767 (100)

Table 2. Prevalence of intestinal parasites on transmigrants, Phase 2 survey, according to their districts of origin in East Java, 1976.

Parasite species	Three groups of transmigrants					
	Surabaya	Bojonegoro	Bondowoso	Malang	Ngawi/ Madiun	Total
Entamoeba histolytica	12.5 *	22.5	28.3	14.8	9.3	18.7
Entamoeba hartmanni	0	10.2	1.9	1.7	2.3	3.7
Entamoeba coli	25.0	22.5	34.0	14.8	20.9	22.9
Endolimax nana	0	30.6	15.1	14.8	30.2	21.0
Iodamoeba butschlii	0	18.4	5.7	16.4	32.6	16.8
Giardia lamblia	25.0	12.2	3.8	1.7	2.3	5.6
Chilomastix mesnili	25.0	4.1	1.9	1.7	0	2.8
Ascaris lumbricoides	62.5	20.4	50.9	85.3	11.6	46.3
Trichuris trichiura	37.5	8.2	39.6	24.6	39.5	28.0
Hookworm	50.0	95.9	71.7	72.1	90.7	80.4
Enterobius vermicularis	12.5	4.1	0	11.5	4.7	5.6
Total number examined	8	49	53	61	43	214

* Percentage.

and hookworm. *A. lumbricoides* infection ranged from 11.6% for people from Ngawi/Madiun to 85.3% for those from Malang, that of *T. trichiura* ranged from 8.2% from Bojonegoro to 39.6% from Bondowoso and hookworm from 50.0% in Surabaya to 95.9% in Bojonegoro (Table 2). The prevalences of infection with other intestinal parasites were relatively low.

Of 625 blood smears examined for malaria and microfilaria during the Phase 2 survey, only one (0.2%) was positive with *Plasmodium vivax*. In Phase 3, 178 blood smears were taken of transmigrants after they had settled in Lampung for 6 – 24 months, and 17 (10%) were positive with malaria parasites; 13 with *P. vivax*, 3 *P. falciparum* and 1 mixed infection (Table 3 and 4). The age and sex distribution of these malaria patients is shown in Table 4. The parasite rate was higher in males (14.8 % than in females (2.6%). The highest parasite rate was found in the age group of 20 – 29 years old (24.1%), followed by a rate of 11.1% in the age group of 40–49, 10.6% in those aged 10–19 years and less than 4% in those aged 50 years and beyond. No filariasis case was detected.

Results of testing sera for Group B (JE) antibodies with the hemagglutination inhibition (HI) test, showed high rates of positivity in all ages tested (Table 5). The total prevalence rate was 45.5% in the Phase 2 survey, and was 84.9% in the Phase 3 survey. Testing for antibodies of Group A (CHIK) revealed low rates, and positivity was only shown in the higher aged group from 30 years and over (Table 6). There was no marked difference in the prevalence between the Phase 2 and Phase 3 surveys, the

Table 3. Prevalence of malaria and microfilaria parasites pre- and post-stage in Way Abung III.

Parasite	Number of parasitaemia (prevalence)	
	Pre-stage	Post-stage
Malaria	1 (0.2) *	17 (10)
Microfilaria	0	0
Total examined	625	178

* In brackets: percentage

Table 4. Number of malaria parasite species by age and sex of people examined, Phase 3 survey, Way Abung III, 1978.

Parasite species	Male	Female	0 – 9	10 – 19	20 – 29	30 – 39	40 – 49	50 and over	Total
P. vivax	11 (10.9) *	2 (2.6)	1 (3.2)	5 (10.6)	3 (10.3)	0	3 (11.1)	1 (3.5)	13 (7.3)
P. falciparum	3 (3)	0	0	0	3 (10.3)	0	0	0	3 (1.7)
Mixed infection	1 (1)	0	0	0	1 (3.5)	0	0	0	1 (0.6)
Total number of malaria cases	15 (14.8)	2 (2.6)	1 (3.2)	5 (10.6)	7 (24.1)	0	3 (11.1)	1 (3.5)	17 (9.6)
Total number examined	101	77	31	47	29	15	27	29	178

* Percentage

Table 5. Prevalence of HI antibody to JE virus in transmigrants pre- and post-stage (6 – 24 months after their arrival in Way Abung III)

Age group in years	Age distribution of transmigrants pre-stage	Pre-stage (1976)			Post-stage (1978)		
		Number tested	Number pos..	%	Number tested	Number pos.	%
0 – 9	228	30	11 (84)*	36.7 (36.8)**	7	3 (98)*	42.9 (43.0) **
10 – 19	168	99	35 (59)	35.3 (35.1)	41	30 (123)	73.2 (73.2)
20 – 29	122	68	31 (56)	45.6 (45.9)	29	26 (109)	89.7 (89.3)
30 – 39	135	67	36 (72)	53.7 (53.3)	14	14 (135)	100 (100)
40 – 49	76	54	29 (41)	53.7 (53.9)	26	23 (67)	88.5 (88.2)
⩾ 50	38	34	18 (20)	52.9 (52.6)	29	28 (37)	96.5 (97.4)
Total	767	352	160 (332)	45.5 (43.3)	146	124 (569)	64.9 (74.2)

* In brackets is the number positive standardized to the age distribution of the transmigrants in the pre-stage.

** In brackets is the standardized percentage.

total rates being 5.5% and 8.2% respectively.

Results of the fluorescent antibody test (FAT) showed that prior infections with scrub and murine typhus were prevalent among the transmigrants. Sero-positivity to scrub typhus antigens revealed no marked differences in prevalence between Phase 2 and Phase 3 surveys, the rates being 4.0% and 3.4%. Similarly no marked differences were found in sero-positivity rates to murine typhus antigens between the Phase 2 and Phase 3 surveys were observed, the rates being 13.7% and 13.8% (Table 7).

A total of 304 sera of various domestic and feral animals were tested for HI antibodies to arboviruses of the A and B groups. Cows, goats, chickens and bats were variously sero-positive. The prevalence of Group B arboviral sero-positivity was higher than that of Group A sero-positivity in these animals. Cows had the highest prevalence rates, with 35% positive HI antibody to arboviruses of the Group B (Table 8).

Table 6. Prevalence of HI antibody to CHIK virus in transmigrants pre- and post-stage (6 – 24 months after their arrival in Way Abung III)

Age group in years	Age distribution of transmigrants pre-stage	Pre-stage (1976)			Post-stage (1978)		
		Number tested	Number pos.	%	Number tested	Number pos.	%
0 – 9	228	29	0 (0)*	0 (0)**	7	0 (0)*	0 (0)**
10 – 19	168	95	0 (0)	0 (0)	41	0 (0)	0 (0)
20 – 29	122	65	0 (0)	0 (0)	29	0 (0)	0 (0)
30 – 39	135	67	3 (6)	4.5 (4.4)	14	0 (0)	0 (0)
40 – 49	76	54	10 (14)	18.5 (18.4)	26	4 (12)	15.4 (15.6)
50 and over	38	33	6 (7)	18.2 (18.4)	29	8 (10)	27.6 (26.3)
Total	767	343	19 (27)	5.5 (3.5)	146	12 (22)	8.2 (2.9)

* In brackets is the number positive standardized to the age distribution of the transmigrants in the pre-stage.

** In brackets is the standardized percentage.

Table 7. Prevalence or positive FAT to scrub and murine typhus in transmigrants pre- and post-stage (6–24 months after their arrival in Way Abung III).

	Scrub typhus		Murine typhus	
	Pre-stage (1976)	Post-stage (1978)	Pre-stage (1976)	Post-stage (1978)
No. of transmigrants in the pre-stage	767		767	
No. of transmigrants tested	488	145	488	145
No. pos. FAT (1 : 40 and over)	20 (31)*	5 (26)	67 (105)	20 (106)
Percentage	4.1(4.0)**	3.4(3.4)	13.7(13.7)	13.6(13.8)

* In brackets is the number positive standardized to the population or the transmigrants in the pre-stage.

** In brackets is the standardized percentage.

Table 8. Prevalence of HI antibody to group A and B arbo-virus in animal sera collected during Phase 3 in Way Abung III.

Animal species	No. tested	No. positive of HI antibody	
		Group A	Group B
Cow	54	1 (2) *	19 (35)
Goat	100	3 (3)	8 (8)
Dog	4	0	0
Chicken	67	1 (1)	1 (1)
Duck	9	0	0
Wild avian	32	0	0
Bat	46	0	4 (4)
Total	304	5 (2)	32 (11)

* In brackets is the percentage positive.

A total of 1556 mosquitoes consisting of 8 genera with at least 39 species were determined. Among the total catch, *Aedes* (7 spp). comprised 5.0%, *Aedeomyia* (1 sp) 3.4%, *Anopheles* (11 spp.) 4.3%, *Coquillettidia* (3 spp.) 24.0%, *Culex* (10 spp.) 46.0%, *Mansonia* (6 spp.) 17.2%, *Toxorhynchites* (1 sp.) 0.06% and *Uranotaenia* (1 sp.) 0.06%. Among the *Aedes* spp., *Ae. albopictus, Ae. lineatopennis* and *Ae. vexans*

Table 9. Summary of mosquito species collected, Phase 3 survey, in Way Abung III, June 1978.

Mosquito species	Total No. collected	Mosquito species	Total No. Collected
AEDES	*78*	CULEX	*715*
Aedes albopictus	37	*Cx. bitaeniorhynchus*	9
Ae. annandalei	1	*Cx. vishnui*	104
Ae. poecilus	3	*Cx. fuscanus*	2
Ae. lineatopennis	20	*Cx. gelidus*	29
Ae. novoniveus	2	*Cx. fuscocephalus*	5
Ae. vexans	12	*Cx. quinquefasciatus*	62
Ae. annularis	3	*Cx. pseudovishnui*	136
		Cx. sinensis	2
AEDEOMYIA	*53*	*Cx. tritaeniorrhynchus*	207
Aedeomyia spp.	53	*Cx. whitmorei*	159
ANOPHELES	*67*	MANSONIA	*267*
An. annularis	3	*Ma. annulata*	4
An. barbirostris	2	*Ma. bonneae*	38
An. campestris ?	1	*Ma. dives*	4
An. karwari	7	*Ma. uniformis*	198
An. nigerrimus	5	*Ma. indiana*	23
An. nitidus	4		
An. peditaeniatus	6	TOXORHYNCHITES	
An. philippinensis	28	*Toxorhynchites* sp.	1
An. subpictus	3		
An. tessellatus	2	URANOTAENIA	
An. vagus	6	*Uranotaenia* sp.	1
COQUILLETTIDIA	*374*		
Cq. crassipes	371		
Cq. hodgkini	1		
Cq. ochracea	2		
Total	572		984

Grand Total 1556 specimens.

were the more common *Aedes* examined. For *Anopheles* spp. *An. philippinensis* was the most common mosquito examined, and of the *Coquillettidia* spp., *Cq. crassipes* was the most abundant. Among the *Culex* spp. at least 4 species were very common. *They are Cx. vishnui, Cx. pseudovishnui, Cx. tritaeniorrhynchus* and *Cx. whitmorei.* For *Mansonia* spp. *Ma. uniformis* was the most abundant followed by *Ma. bonneae* and *Ma. indiana.* Of other genera examined, *Aedeomyia* was shown to be common (Table 9). Besides mosquitoes, many *Culicoides* of the family Ceratopogonidae were also examined. At least 10 species were identified, and they were *C. amaniensis, C. arakawai, C. anophelis/humeralis, C. guttifer, C. huffi, C. maculatus, C. malayae, C. matsuzawai/palpifer, C. peregrimus* and *C. schultzei.* Other biting insects of the genus *Phlebotomus* were also collected.

A total of 140 rats and bats, consisting of 6 species of rats and 4 species of bats were examined. Among the rats, *Rattus r. diardii* (house

Table 10. Summary of feral animal species and ecto-parasites collected.

Hosts			Ecto – Parasites from rats		
Animal species	Number collected	% of species composition	Parasite species	Number collected	% of species composition
Rattus rattus diardii	79	56.4	Scrub typhus vectors		
Rattus exulans	21	15.0	*Leptotrombidium (L.) deliense*	13	6.6
Rattus tiomanicus	16	11.4	*L. (L.) fletcheri*	6	3.0
Rattus surifer	3	2.2	*L. (L.) bodense*	1	0.5
Rattus niviventer	3	2.2	Non-vector species		
Rattus whitehaedi	1	0.7	*Laelaps aingworthae*	4	2.0
Cynopterus brachiotis	14	10.0	*L. echidninus*	9	4.6
Cynopterus sphinx	1	0.7	*L. nutalli*	21	10.7
Megaerops ecaudatus	1	0.7	*L. turkestanicus*	4	2.0
Eonycteris speleae	1	0.7	*L. scrulpturatus*	1	0.5
			L. myonyssognathus	1	0.5
			Longolaelaps whartoni	3	1.5
			L. laelaps longulus	1	0.5
			Tricholaelaps sp.	1	0.5
			Astigmata	2	1.0
			Ascoschoengastia (A) indica	42	21.3
			A. (A.) nr. indica	10	5.1
			A. (A.) lorius	6	3.0
			Gahrlepia (Walchia) d. disparanguis	23	11.7
			G. (Walchia) disp. pingue	21	10.7
			G. (Walchia) lewthwaitei	10	5.1
			Walchiella oudemansi	5	2.5
			Microtrombicula sp.	2	1.0
			Ticks	11	5.6
Total	140	100		197	100

rat) was the predominant species, followed by *R. exulans* and *R. tiomanicus* (field rats), while few individuals of the forest rats *(R. surifer, R. niviventer* and *R. whiteheadi)* were caught. Of the bat species, *Cynopterus brachyotis* was the commonest, and one of each of the *C. sphinx*, *Megaerops ecaudatus* and *Eonycteris speleae* were caught (Table 10). Sixteen ectoparasite species were recovered from the rats and identified. Of the 3 *Leptothrombidium* species two of them are vectors of scrub typhus, and one a potensial vector. The remaining 13 species are hard mites which have yet to be established as parasites of medical importance (Table 10).

DISCUSSION

The present results which show that *A. lumbricoides, T. trichiura* and hookworm are the most prevalent intestinal helminths among the transmigrants before translocation, and that

they have variable prevalence rates, support the findings of others who have studied people in Java and in other islands in Indonesia, as reviewed by Runizar (1978). Comparison between the Phase 2 and Phase 1 surveys of these helminths, shows higher rates of *A. lumbricoides* and *T. trichiura* in the latter, and the reverse was found for hookworm. As there were no analysis made of paired data, no conclusion can be made whether the new surroundings are more or less hazardous for soil-transmitted helminths infection than the place of origin.

In the case of malaria infection, it was shown that the infection rate rose from 0.2% during the Phase 2 examination to 10% in the Phase 3 survey. The infection rate was higher in males than females, and there was a significantly higher infection rate in people over 10 years than those under 10 years of age. It might be that the male population over 10 years of age spent more time outdoors in the evening, which made them more vulnerable to infection than the rest of the population. Cross et al., (1970) in their survey on blood and intestinal parasites examined 1508 blood smears from several villages of Boyolali Regency, Central Java and none was positive with malaria. Clarke et al., (1973 b) detected only 2 positives in 1384 blood specimens from the Yogyakarta area of Java. Results of our studies and those of Cross et al. indicate that transmigrants contract malaria in their new environment.

There was no filariasis infection detected. The failure to detect any filariasis case during Phase 2 and 3 could be due to sampling or to a very low level transmission rate. Partono et al., (1972), found that the microfilaria rate among Javanese transmigrants in Margolembo, South Sulawesi, was 0.6% eight months after their arrival, but the rate was more than 30% for the group which had arrived 33 years earlier. Thus, he concluded that the microfilaria rate was related to the length of residence of transmigrants in the area. Arbain Yoesoef et al., (1973), also found that the microfilaria rates of transmigrants from Bali, who settled in the district of Parigi, Central Sulawesi, was within the range of 0 – 13% after 10 years of residence, while the indigenous population had a microfilaria rate of 42%. In a lesser endemic area of the same district where the natives had a microfilaria rate of 11%, this rate among the Balinese transmigrants was zero after 4 years of residence. In East Kalimantan, Sudomo et al., (1980), found that the microfilaria rate of transmigrants from Java was 0.4% after 14 months of residence, while the neighbouring native villages had a microfilaria rate of 9.3%. Our present findings add further support to the supposition that microfilaria rates among transmigrants are related to time and length of residence in new environments.

Regarding the arbovirus infection risk, Kanamitsu et al., (1979), stated that CHIK and JE antibody positivities were highly prevalent in localities of the Oriental zoogeographic region. In the present studies arbovirus infections of Group A and B were prevalent among the transmigrants in Way Abung III, Lampung Province, Sumatra. The higher prevalence of JE in the Phase 3 than the Phase 2 survey suggests that transmigrants are being subjected to increased transmission in their new environments. Further studies with paired data are necessary to confirm this observation.

CHIK seropositivity was shown to be prevalent among populations aged 40 years and above only. Kanamitsu et al., (1979), similarly showed that CHIK antibody was rare or absent in residents of Indonesia in the Western part of the Wallace Line under the age of 30, but beyond 30 years of age the prevalence increased precipituously. They opined that CHIK virus had been inactive for about 30 years, and speculated that CHIK virus was brought into the country by foreign troops during and after the Second World War, and the virus faded out there with repatriation of the troops.

The mosquitoes caught were not examined for infection with filariasis or malaria nor used for isolation of arboviruses. However, of 1556 individual mosquitoes examined, 3.4% were *Anopheles*, 24.0% *Mansonia* species, 46.0% *Culex* spp. and 5.0% *Aedes* spp. Among the *Anopheles*, *An. barbirostris*, *An. subpictus* and *An. hyrcanus* group may be potential vec-

tors of malaria in the transmigration area. These three *Anopheles* species have been established as vectors in some parts of Indonesia (Gandahusada and Sumarlan, 1978), and *An. barbirostris* was also a vector of brugian filariasis (Bahang et al., 1984). Five *Mansonia* species were examined, and according to order of abundance, they were *Ma. uniformis, Ma. bonneae, Ma. indiana, Ma. annulata* and *Ma. dives.* All these *Mansonia* spp. have been incriminated as vectors of brugian filariasis in Indonesia (Suzuki et al., 1982, Sudomo et al., 1981, Partono et al., 1972). Among the *Aedes* and *Culex* mosquitoes examined, *Ae. albopictus, Ae. vexans, Cx. tritaeniorrhynchus, Cx. bitaeniorrhynchus, Cx. quinquefasciatus, Cx gelidus* and *Cx pseudovishnui* may be potential vectors of arbovirus infections. *Culex tritaeniorrhynchus* and *Cx gelidus* were established as vectors of JE in West Java by Van Peenen et al., (1975).

Among the domestic and feral animals tested against the alphaviruses (Group A) and the flaviviruses (Group B), goats were shown to have the highest prevalence rate for the former antigens, and cows for the latter. Koesharyono et al., (1973), found 91.5% of 399 pigs with antibody to JE virus from a slaughterhouse in Jakarta. Van Peenen et al., (1974), found 40.4% of 391 sera of cattle from Central and East Java examined in a slaughter-house in Jakarta having HI antibody tc JE virus.

The prevalence of positive FAT against scrub and murine typhus antigens during Phase 2 and Phase 3 surveys were generally low although seropositivity of murine typhus was higher than that for scrub typhus. There was no marked difference found between the pre- and post-stage surveys. The finding of the classical scrub typhus vector, *Leptotrombidium (L) deliense,* and other chigger vector species on the commensal and feral rodent population in the vicinity of the transmigration areas suggests that scrub typhus may be endemic in the area. Scrub typhus is associated with the ecology of the fields, scrub, fringe and forest habitats which are common in transmigration shemes. Although the present results showed low prevalence of seropositivity among the transmigrants, infection might be expected to increase with time due to favourable ecological niches suitable for the propagation of the vectors, and the prevalence of rodent hosts in such areas.

SUMMARY

A study of desease risks to transmigrants from Java in their new environment at Way Abung III in Lampung Province was carried out from 1976 to 1978. Laboratory results conducted on persons before translocation and after resettlement were compared.

The prevalence of HI antibody of CHIK on pre-and post surveys was statistically not significant, 3.5% and 2.9% respectively, and the authors are of the opinion that no increased transmission had occured in Way Abung III. Pre and post residence rates of FAT positivity sere statistically not significant for either scrub or murine typhus, namely 4.0% (pre) and 3.4% (post) for scrub typhus and 13.7% (pre) and 13.8% (post) for murine typhus. The transmigtrants were subjected to malaria transmission but at a low level as shown by the rise in prevalence of parasitaemia from 0.2% to 10%. The malaria vector was not known, but potential vectors were present in a low level of density at the time of survey. No filaria parasites were found during the Phase 2 and Phase 3 surveys. As the potential vectors of *Brugia malayi* were common and since a low endemicity of filariasis exists in the neighbouring native villages, it is envisaged that filariasis prevalence rates may increase with time and length of stay in the Lampung transmigration area.

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